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10/562,176

12/23/2005

Tetsujiro Kondo

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04/08/2008

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EXAMINER

NEWMAN, MICHAEL A

ART UNIT

PAPER NUMBER

2624

NOTIFICATION DATE

DELIVERY MODE

04/08/2008

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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|------------------------------|--------------------------------------|-------------------------------------|--|
| Office Action Summary | Application No. 10/562,176 | Applicant(s) KONDO ET AL. | |
| | Examiner MICHAEL A. NEWMAN | Art Unit 2624 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☒ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The amendment received on January 1st, 2008 has been entered.
2. In view of the amendment to the claims, the cancellation of claim 4, the amendment of claims 1, 3 and 5, and the addition of claims 6 and 7 are acknowledged.
3. In view of the cancellation of claim 4 and the amendment of claims 1, 3 and 5, the rejections of claims 1, 3, 4 and 5 under 35 U.S.C. 112 are withdrawn.
4. In view of the cancellation of claim 4 and the amendment of claim 5, the rejections of claims 4 and 5 under 35 U.S.C. 101 are withdrawn.
5. The amendment to the abstract to correct minor informalities has been entered.

Response to Arguments

6. Applicant's arguments filed on January 1st, 2008 have been fully considered but they are not persuasive.
 - a. In pages 9 – 11 of the Remarks filed on January 1st, 2008, with regards to the rejections of claims 1, 3 and 5 under 35 U.S.C. 103 over Buckler et al. (U.S. Patent No. 5,030,984), "Buckler", and Kanbara (U.S. Patent No. 5,689,737), "Kanbara", Applicant's Representative submits that Buckler does not teach any means for generating equations including pixel values *without movement blurring occurring*, as required by the independent claims. Specifically, Applicant's Representative points out that Buckler operates under the assumption that any intensity changes measured in time are attributed to motion in space, such that

the calculated optical flow field indicates the displacement of the site between two sequential image frames. As such, Applicant's Representative submits that Buckler requires motion. Indeed, the purpose of Buckler's teaching is to quantify amount of motion perceived by each pixel of the captured image, which results in undesirable blurring, in order to approximate pixels without the motion to obtain pixels without blurring due to motion (although this final step is only suggested in the background of the invention). The Examiner respectfully points out that this is also the case in the claimed invention. As understood from claim 1, and further evidenced by paragraph 1375 of the specification, the present invention involves:

- capturing an image with a sensor having a plurality of pixels
- finding discontinuities such as edges or contours
- calculating movement vectors for an object using the detected edges in order to quantify the amount of movement
- establishing a corrective relationship between the captured pixels (which clearly exhibit the motion/blurring quantified by the previous step) and corrected pixels that do not exhibit movement or blurring. This, under an assumption that values of the captured pixels, integrated while a shifting quantified by the movement vector occurred, are the values of the corresponding corrected pixels not showing movement blurring.
- generating the required equations corresponding to the corrective relationship
- estimating the corrected non-blurred pixels by applying the generated equations

Clearly, although the goal of the present invention is to estimate pixel values without movement blurring occurring, the actual input pixel values do exhibit motion and blurring. Likewise in Buckler, by constraining the derivative of pixel intensity with respect to position and time to zero (considered the second equation), the desired pixel values should exhibit no displacement over time. The optical flow, consisting of motion vectors, is found by evaluating partial derivatives of the detected pixel values using the expression in Col. 6 lines 64 – 65 (considered the first equation). Additionally, note that the model corresponds to the optical flow field, and the term ‘normal equation’ is considered to be ‘an equation’, pending any further definition within the claim.

However, as previously stated above and in the previous office action, Buckler does not teach the final estimation of the pixels with the motion eliminated. Kanbara discloses a camera with a shake detection device in which displaced pixels are realigned to the proper positions based on the detected movement (Kanbara Col. 3 line 62 – Col. 4 line 5). As previously reasoned, it would have been obvious to use the resulting motion vectors of Buckler to correct the blur due to movement, as suggested by Buckler, by pixel realignment as taught by Kanbara in order to improve the image quality.

Given this reasonable interpretation of the prior art and the claims, the Examiner respectfully insists that the rejections, as set forth below, of claims 1, 2, 3, 5, 6 and 7 under 35 U.S.C. 103 in view of Buckler and Kanbara are proper.

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 1, 2, 3, 5, 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buckler et al. (U.S. Patent No. 5,030,984) in view of Kanbara (U.S. Patent No. 5,689,737). Hereinafter referred to as Buckler and Kanbara, respectively.

a. Regarding claims 1, 3, 5 and 6, Buckler teaches a signal processing device comprising: processing region setting means for setting a processing region (**Buckler Col. 10 lines 16 – 24**) within image data wherein a light signal of the real world is projected on a plurality of pixels, each having a time integration effect (**Buckler Fig. 2 element 16 – Col. 5 lines 11 – 16**) [**Note that the CCD sensor, having pixels, accumulates/integrates outside light at a period of time corresponding to the time the camera shutter is open**], and a portion of the continuity of the light signal of the real world is lost (**Buckler Col. 6 lines 19 – 21**) [**Note that the gradient, corresponding to image changes, indicates a loss of continuity (due to edges or object features)**]; movement vector setting means for setting movement vectors for an object within said image data corresponding to the continuity of the light signal of the real world, wherein a portion of the continuity of said image data is lost (**Buckler Fig. 1 element 26 – Col. 6 lines 19 – 25 and 42 – 44**); model generating means for modeling the relation between the pixel value of each of the pixels within said processing region and the pixel value of each of the pixels without movement blurring

occurring, assuming that the pixel value of each of the pixels within said processing region is a value wherein the pixel value of each of the pixels without movement blurring occurring which correspond to said object is integrated while shifting corresponding to said movement vector (**Buckler Col. 6 lines 19 – 25 and 42 – 44**) [**Note that the relation/displacement in regions with intensity changes is modeled by motion vectors of the optical flow field**]; normal equation generating means for generating a normal equation using a first equation wherein the pixel value of each of the pixels within said processing region is substituted into a model generated by said model generating means (**Buckler Col. 6 line 63**) [**Note that f_x and f_y are the measured values which are substituted into the equation**], and a second equation which constrains the relation between each of the pixels without said movement blurring occurring (**Buckler Col. 6 line 29**) [**Note that the constrain on the derivative with respect to position and time to be 0 corresponds to desired pixels without displacement change or motion**]. Buckler further teaches that the calculated motion vectors can be stored in the memory of the camera and used a later time in a restoration process (**Buckler Col. 6 lines 10 – 16**). However, **Buckler fails to teach** and actual world estimating means for estimating a pixel value of each pixel wherein said movement blurring is not occurring, by computing said normal equation which is generated by said normal equation generating means.

Pertaining to the same field of endeavor, Kanbara teaches a shake detection system for a camera in which displaced pixels are realigned to

the proper positions based on detected movement coordinates (Kanbara Col. 3 line 62 to Col. 4 line 5). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the resulting motion vectors generated by Buckler to correct the blur due to movement, as suggested by Buckler, by pixel realignment as taught by Kanbara in order to improve the image quality by removing effects of blurring, shaking, etc.

- Regarding claim 5, Buckler teaches embodying the above-discussed process in program code to be executed by a computer (**Buckler – “Appendix A” – Cols. 11 to 18**).

b. Regarding claims 2 and 7, Buckler as modified by Kanbara with regards to claims 1 and 6, further teaches that said normal equation generating means generates a normal equation using a first equation wherein the pixel value of each of the pixels within said processing region is substituted into the model generated by said model generating means (**Buckler Col. 6 line 63**) [Note that f_x and f_y are the measured values which are substituted into the equation], and a second equation wherein the difference of the pixel value of each pixel wherein said movement blurring is not occurring (**Buckler Col. 6 line 29**) [Note that the derivative in x and y with respect to time measures the difference of pixel values (as set by the definition of a derivative), and setting it to 0 requires that those pixels do not exhibit change or displacement].

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL A. NEWMAN whose telephone number is (571)270-3016. The examiner can normally be reached on Mon - Thurs from 9:30am to 6:30pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir A. Ahmed can be reached on (571) 272-7413. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2624

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

M.A.N.

/Samir A. Ahmed/

Supervisory Patent Examiner, Art Unit 2624